

REMARKS

Preliminarily, Applicants request the Examiner to acknowledge and approve the drawings filed March 30, 2001.

The specification has been amended to correct a typographical error.

Claims 1 and 5 have been amended to recite an amount of flank wear of not greater than 0.2 mm and an amount of notch wear of not greater than 0.22 mm when the silicon nitride member is used to cut plain cast iron. Support is found, for example, at page 22, lines 7-9 of the specification.

Claims 3 and 6 have been amended to delete conditions (4) and (5), and to require a grain boundary phase in amount of 50% to 75% by volume at a depth of 300 μm from the surface of the substrate, namely, condition (3). Entry of the amendments is respectfully requested.

Review and reconsideration on the merits are requested.

Claims 1-4 and 10-13 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent 5,296,008 to Moriguchi et al or U.S. Patent 4,745,022 to Miyake et al, or any of JP 04-136174, 06-246511 or 06-063804 (all Mitsubishi Materials Corp) or JP 10212183. The grounds for rejection remain the same as set forth in the previous Office Action.

Particularly, the Examiner considered each of the cited references as disclosing the claimed coating on the claimed silicon nitride and having the claimed amount of sintering aids. Because the disclosed silicon nitride and coating are said to be the same as that of the invention, the Examiner considered that the prior art silicon nitride members would inherently meet the claimed bending strength.

The Examiner acknowledged Applicant's position that the two-step primary sintering process of the present invention provides a product that is entirely different from those of the prior art. However, the Examiner did not consider this argument to be persuasive as lacking factual support.

Applicant traverses, and respectfully requests the Examiner to reconsider in view of the claims and the following remarks.

The silicon nitride member of the invention is made by a primary sintering process which includes two distinct steps differing in both temperature and pressure. See claim 7. That is, the silicon nitride member of the present invention, characterized in terms of strength of the silicon nitride member measured after the substrate is coated with the hard film and grain boundary phase content, is achieved by a two-step primary sintering process.

In the Response filed November 13, 2003, Applicant pointed out that each of the cited references describes a sintered silicon nitride materials made by a primary sintering process consisting of a single step. Additionally, Applicant urged criticality in the second step of the sintering process by reference Tables 1 and 2 at pages 20 and 21 of the specification, as providing a product that is different from and unobvious over those of the prior art. The comparative data shows that silicon nitride samples subjected to a second-step sintering temperature or pressure outside the scope of present claim 7 did not produce a product having the requisite amount of grain boundary phase.

The independent product claims are claims 1 and 3. Claim 1 requires a bending strength ratio of from 70 to 95%, whereas claim 3 specifies the amount of grain boundary phase as a function of depth from the surface of the substrate. The test data in the specification shows that the comparative examples did not have a grain boundary phase at 300 μm from the surface of the substrate of from 50% to 70% by volume as claimed, and thus exhibited a large amount of flank wear and notch wear as compared to the samples of the invention.

To further clarify the above-noted differences, claim 1 has been amended to require an amount of flank wear of not greater than 0.2 mm and an amount of notch wear of not greater than 0.22 mm. Patentability is based on the test data shown in Table 2, particularly noting that none of the Comparative Examples (where the second sintering step has a temperature or pressure outside the scope of claim 7) exhibited both a high bending strength ratio and low flank wear and notch wear.

Claim 3 has been amended to delete conditions (4) and (5), and to require a grain boundary phase in an amount of 50% to 70% by volume at a depth of 300 μm from the surface of the substrate, namely, condition (3). Applicant submits that patentability is established by reference to the test data in Table 2 at page 20 of the specification. None of the Comparative Examples met condition (3).

Table 2 of the specification is reproduced below:

Table 2

	Sample No.	Volatilization Rate (% by Weight)	Amount of Grain Boundary Phase at Depth 300 μ m (% by Volume)	Bending Strength of (MPa)			Amount of Flank Wear (mm)	Amount of Boundary Wear (mm)
				Before Coating	After Coating	Strength Ratio		
Comp. Example	1	1	90	1295	1225	94.6	0.35	0.31
	2	1.1	89	1290	1189	92.2	0.35	0.39
Example	3	1.6	69	1283	1210	94.3	0.20	0.20
	4	1.5	70	1300	1235	95	0.20	0.22
Comp. Example	5	1.3	80	1277	1184	92.7	0.34	0.35
Example	6	2.2	63	1287	1158	90	0.17	0.17
	7	3.7	48	959	532	55.5	0.12	0.11
Comp. Example	8	1.3	80	1288	1224	95	0.33	0.35
	9	3.1	53	1244	1009	81.1	0.15	0.16
Comp. Example	10	4	40	915	502	54.9	0.13	0.13
	11	1.3	81	1285	1199	93.3	0.32	0.33
	12	2.5	58	1281	1136	88.7	0.17	0.18
Example	13	3.4	52	1235	909	73.6	0.13	0.12
	14	3.5	50	1223	856	70	0.13	0.15
	15	1.3	86	1307	1191	91.1	0.33	0.4
	16	4	42	901	462	51.3	0.13	0.18
Comp. Example	17	Decomposition of silicon nitride		Unable to evaluate				

In summary, it is respectfully submitted that Applicant has demonstrated that the claimed silicon nitride member, made by a primary sintering process which includes two distinct steps differing in both temperature and pressure, is different in an unobvious way from the prior art products. As to claim 1, the test data of Table 2 shows that none of the Comparative Examples (with the second sintering step having a temperature of pressure outside the scope of claim 7) exhibited both a high bending strength ratio and low flank wear and notch wear as claimed. As shown in the Response under 37 C.F.R. § 1.111 filed November 13, 2003, all of the prior art products employed a single-step sintering process, and the Comparative Examples presented in the specification are closer to the claimed product than the cited prior art. As to claim 3, the test data in the specification shows that the Comparative Examples did not have a grain boundary phase at 300 μm from the surface of the substrate in an amount of from 50% to 70% by volume as claimed, namely, condition (3), and thus exhibited a large amount of flank wear and notch wear as compared to the samples of the invention.

For the above reasons, it is respectfully submitted that the cited references do not anticipate the present claims, and withdrawal of the foregoing rejection under 35 U.S.C. § 102(b) is respectfully requested. Furthermore, independent method claims 5 and 6 have been amended to include all of the limitations of product claims 1 and 3, respectively. If the products claims are found to be patentable, then Applicant respectfully requests rejoinder of the non-elected method claims pursuant to MPEP § 821.04.

Withdrawal of all rejections and allowance of claims 1-13 is earnestly solicited.

AMENDMENT UNDER 37 C.F.R. § 1.116
U.S. Application No. 09/821,020

Q63680

In the event that the Examiner believes that it may be helpful to advance the prosecution of this application, the Examiner is invited to contact the undersigned at the local Washington, D.C. telephone number indicated below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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